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SENSATION AND PERCEPTION

I. THE GENETIC RELATIONSHIP

AS present-day psychology conceives it, the sensation is one, perhaps the most important, of the elementary conscious processes. It marks the limit, at least in one direction, to which we can carry our introspective analysis of the contents of consciousness. In the adult the sensation occurs always in combination. One never experiences sensations which are not structural elements in perceptions or other complexes. Colors, for example, are seen as the colors of or on things; the tones are elements in voices or other complex sounds, or, at least, they are heard as coming from a certain direction; the cutaneous sensations are the consistencies and temperatures of hard or soft, warm or cold, things; etc. It is possible, however, by introspection to analyze out the simple sensations which go to make up, say, our percept of a red paper disc, and to attend merely to the red color. By such means we can study the sensation itself and observe the characteristic changes it undergoes. As the psychologist is at pains to point out, the sensation thus isolated by attention has *ipso facto* undergone certain changes of attribute. As an elementary constituent of the complex percept, it is, he says, an artifact, an abstraction, whose characteristics in the limbo of inattention can only be assumed. Some of the difficulties of this conception I have discussed in a former article.[1]

But the sensation is not regarded merely as an analytic element, but as a genetic element as well. While certain of the more careful analytic psychologists, like Professor Titchener, for example, are at pains to discriminate between the analytically simple and the genetically prior, and to point out that the elements reached by analytic introspection of adult consciousness are not to be taken as genetic elements, it is nevertheless true that the sensation does figure very widely as genetically primary. Experience of sensory qualities is put first in the development and is the prius from which the complex percepts of things are derived. Thus we find even such a man as Baldwin saying: ''The child begins in its prenatal and early postnatal experience with blank sensations and pleasure and pain with the motor adaptations to which they lead, passes into a stage of apprehension of objects with response to them by ''suggestion,'' imitation, etc.[2] And again more significantly: ''The study of children is generally the only means of testing the truth of our mental analyses. If we decide that a certain complex product is due to a union of simpler mental elements, then we may appeal to the proper period of child-life to see the union taking place . . . there is hardly a question of analysis now under debate which may not be tested by this method.''[3] The psychical structures as they exist in the adult have, it is held, been formed almost entirely in the course of his individual experience. So when the complex percept is pulled apart until the process of analysis can reach no further, it is assumed that the elementary constituents thus reached are older in the mental life than the percept which they formed. The success of introspection depends precisely on the completeness with which the work of experience is undone. In fact, it is largely from this that its difficulty arises. The student entering the laboratory must first of all learn to forget his acquired habits of ''common sense.'' He must, in other words, abstract from all *meaning.* He must observe, not the whirling disc nor the chilly point of the steel, nor the prick of the needle, but this *red,* this *pressure,* this *pain.* In thus paring away all the meanings which experience has developed he is at the same time breaking down the complex percepts into their constituent elements, and—so it is assumed—putting himself as nearly as may be at an earlier stage of development. This difference is indeed admitted: that whereas the sensation to which introspective analysis leads is possessed of a maximum of clearness, being in the focus of a highly concentrated attention, the sensations of the infant float in a field which is in the lowest degree differentiated by attention. Still, it is thought, the sensations *are there* from the beginning, although they have not as yet been discriminated by attention. and out of them the perceptual complexes of mature life are organized. Even among psychologists who repudiate many of the doctrines of the so-called sensationalistic school, it is believed that cognitive experience, any experience of the meaningful, is later than mere sentience, the passive receptivity to the impressions of sense. It is indeed almost a universal belief that the child experiences colors, hears sounds, feels pressures, long before he sees balls, hears voices, or feels solid objects.

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[1] "The Psychological Element," *The Philosophical Review*, July, 1915.

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[2] ''Mental Development,'' page 17.

[3] *Ibid.,* page 15.

It is this doctrine of the genetic primacy of the sensation that I wish to criticize. The thesis to be presented in this paper is that sensations are not genetic elements, but are the products of the same individual development which yields perceptions. The child does not see colors, and can not see them, until, and in so far as, he has already learned to see objects. He does not hear tones until he has learned to hear voices and footsteps, nor feel pressures and muscular sensations until he has learned to feel hands and bottles and rattles. The one capacity develops *pari passu* and is correlative with the development of the other. That is to say, the stimulation of a differentiated end-organ yields a sensation of specific quality only if this sensation has already become a constituent element in perception. The development of meaning is one side, the generation of qualitative distinctness is the other side, of one and the same process of differentiation and integration. Thus if it be a falsification of early experience to describe it in terms of meaning, it is equally a falsification to describe it in terms of the existential, or given.

In the first place, it may be pointed out that this thesis is in harmony with the general facts of evolutionary development. The relatively homogeneous and undifferentiated regularly precede the heterogeneous and specialized. Consequently the assumption reasonable *a priori* is that the beginnings of conscious life possess a minimum of diversification and specialization. Now to suppose that the conscious life of the child begins with the sensing of an indefinite number of distinct visual, auditory, and olfactory qualities, together with those yielded by the cutaneous, muscle, and joint end-organs, is in flat contradiction with this presumption of initial homogeneity. It is claimed, of course, that all the organization of conscious life into complex and interdependent structures and functions takes place during the growth of the individual from infancy to maturity, and the process may continue far into old age. But no new structural elements are supposed to be generated in the process, which is conceived solely as a complication of those existing at the beginning. It is as if the body began its career with a full complement of bone-cells, muscle-cells, skin-cells, liver-cells, etc., and its development into an organism were brought about by the redistribution of these. The psychologist points out, to be sure, that the elementary sense-qualities are, for long, undiscriminated and unattended to; but the infants' experience is nevertheless supposed to contain them in kaleidoscopic confusion, very much as Empedocles's primitive world contained a jumble of arms, feet, ears, and hands. What meaning can be attached to the doctrine that color qualities which have never been discriminated are yet present as existentially distinct conscious elements, seems very doubtful. An undiscriminated difference would seem, indeed, to be indistinguishable from an undiscriminated identity. But however that may be, one might well argue that there was no more reason for supposing psychic life to begin with *disjecta membra* than for the belief that bodily life so begins. So far as we are to be guided by the general principles of organic evolution, the only reasonable assumption to make is that early conscious life is relatively amorphous, and does not possess anything so highly specialized as blues and reds, or high *c*'s and middle *a*'s. Instead of the gaze of the infant, as it wanders aimlessly around, encountering a particolored world, what it sees is more aptly to be described as "exciting," or "vaguely urgent," or "disquieting." As a matter of fact, however, the conscious content of a child is for long inexpressible in words at all; for words, being framed to denote the content of adult experience, are all hopelessly definite and discriminating. We can hope at most only vaguely to characterize, and not to express or describe it.

But if the generally accepted position is so widely at variance with the *a priori* probabilities, on what special grounds is it accepted? Surely, one would suppose, there must be strong and substantial arguments in its favor. If there are such arguments, however, they are not adduced by psychologists. The truth is that the doctrine in question seems to be one which, while tacitly accepted by almost every one so long as it is not challenged, is not actively defended by any one. But, though we do not find the doctrine actively defended, it is not difficult to discover the sources of its hold upon philosophical and psychological thought.

The first of these is the tradition of English empiricism and associationism,[4] from which psychology in the last quarter-century has been struggling to free itself, not as yet with complete success.[5] According to this tradition, analytic simplicity was frankly identified with genetic primacy, applied in political science, it led to individualism and the social contract theory; applied in ethics, it produced the hedonism of the eighteenth century, in which happiness was supposed to be built up out of atomic increments of pleasure; applied in logic, it resulted in the well-known theory that judgments come after concepts and are made out of them, while judgments in turn are put together to form syllogisms. But nowhere has the deceptive truth that "the simple precedes the complex" had wider application than in psychology itself. The formulated principle, that analytic simplicity is equivalent to genetic priority, would indeed be repudiated by most modern psychologists. But to deny the validity of a general principle, and to free oneself from the consequences of its former unquestioned acceptance, are, unfortunately, very different things.

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[4] This tradition is not, it is true, confined to empiricism, but was the common possession of all the thought of the period. The social-contract theory, for example, was not originated by empiricists.

[5] See article, "The Psychological Element."

It would, however, be unfair to modern psychology to suppose that its acceptance of the genetic priority of the sensation is wholly due to inertia in throwing off the yoke of pre-evolutionary dogmatism. There are certain very apparent reasons for supposing that the child has, either at birth or soon after, the capacity for receiving sensations; while it is almost equally apparent that he does not acquire the ability to see objects as significant wholes until later. No doubt it will be urged against what has already been said, that early experience in the race was admittedly relatively amorphous, since our early ancestors, like the simpler forms of animal life to-day, did not possess specialized sense-organs. The possible ''structural'' diversity of the content of the consciousness is determined by the diversity of the external stimuli to which the organism is a subject. If conscious life is present before birth, no doubt it is far more homogeneous and less differentiated than the consciousness of the infant after birth. But with a hypothetical pre-natal conscious life psychology has no concern. The child is equipped at birth with a full set of sense-organs, and if some of these, like the ear, do not function at birth, it is only a few weeks before they are all in operation.

The question, then, which we have to ask is: Do these sense-organs in their early functioning yield, or are they capable of yielding, specific sense-qualities, the qualitatively distinct sensations of the adult? In the adult the stimulation of an end-organ by its appropriate stimulus yields a sensation of specific quality. Moreover, it is incapable of yielding any but its own peculiar sensation-quality. Hence it is natural to conclude that if the corresponding end-organs in the child are capable of functioning, and if their excitation is transmitted to the cortex, there is experienced by the infant a sensation of similar specific quality to that experienced by the adult under similar conditions.

This assumption, in spite of its general acceptance, seems upon examination to be highly questionable. Appeal may be made to two sorts of evidence. First, there are the anatomical and physiological facts and, what is more important, the general psycho-physical theory in the light of which these facts are to be interpreted. Secondly, there is the psychological evidence of the child's behavior. Neither of these, as I shall attempt to show, supports the assumption.

A great advance in psycho-physical theory has taken place during the last quarter-century. This has been due to the growing realization by psychologists that the brain is, and must be regarded as, the organ of bodily *integration,* and not as the "seat of consciousness." This simple but profound insight has already led to momentous consequences, since the days when it was first proclaimed by Avenarius. The treatment of instinct and emotions, attention and cognition has been and is being revolutionized by it, and it has even given rise to a new school of psychologists, the "behaviorists." Nevertheless the traditional view of the sensation, the conscious "element," and its relation to perception has remained practically untouched; and this despite the application of the new theory to perception by Professor Dewey in his pregnant article, "The Reflex Arc Concept"[6] nearly twenty years ago, and his recent development of the same theme in "Perception and Organic Action."[7] That such a reinterpretation of the nature of perception must involve a corresponding reinterpretation of the nature of sensation is obvious. If perception is not to be adequately treated as a complex of associated sensations and sense-images, sensation is not to be adequately treated as an element, either genetic or analytic, of a conscious complex.[8]

[6] *Psych. Rev.,* 1896.

[7] This JOURNAL, Vol. IX, page 645.

[8] The former article of Professor Dewey's is a protest against the view that a given stimulus is experienced as a determinate existent regardless of the response it calls out. Strictly speaking it is a "given stimulus" only in so far as it calls out a given response. "In other words, sensation as stimulus does not mean any particular psychical *existence.* It means simply a function, and will have its value shift according to the special work requiring to be done. . . . Generalized, sensation as stimulus is always that phase of activity requiring to be defined in order that a coordination may be completed. What the sensation will be in particular at a given time, therefore, will depend entirely upon the way in which the activity is being used. It has no fixed quality of its own. The search for the stimulus is the search for exact conditions of action; that is, for the state of things which decides how a beginning coordination should be completed" (*Op. cit.,* p. 368). It is important to note that Professor Dewey uses "sensation" as equivalent to "conscious stimulus" (*Cf. op. cit.,* p. 368). Whatever value or character the stimulus is experienced as having is "sensation." Thus "sensation" is relative. As used in the present discussion, the term corresponds to the "sensation" of analytic psychology. It signifies the irreducible elements of sense as they appear to the analytic attention of the psychologist—the hues of the color-pyramid, the pure tones, the colds, and pressures, and muscular sensations experienced under experimental conditions. As thus used, the term is not relative but absolute. The problem here discussed is, one might say, the converse of Professor Dewey's; for while he has shown that what conscious stimulus—what experienced content—follows the discharge of a given set of end-organs, depends on the response evoked, my inquiry is: what are the conditions under which the stimulation of a given end-organ yields the specific quality attributed to it by the doctrine of specific energy?

The realization of the fact that the brain is the integrative organ of the body involves the conclusion that conscious processes are not to be treated as correlates of the chemical discharge of cells in the cortex. So long as the brain was conceived primarily as the seat of consciousness, the organ by means of which, in some mysterious fashion, the incoming nervous excitation was transmuted into an impression of sense, one might speculate with Tyndall over the possible correlation between a "left-handed spiral motion" of atoms and the emotion of love. One might conceive the whole course of conscious experience of an individual as an accompaniment to a marvelously intricate dance of atoms, the complicated pattern of which was somehow a "correlate" if not a "cause" of the hopes and fears and thoughts of the individual, and the exact mechanical reproduction of which in space and time would reinstate the same sequence of conscious events. All such speculations and the familiar modes of thought which issued in them are no longer permissible. We no longer find it profitable to think of conscious processes as correlated with the molecular transformations in the gray substance of the cortex. Instead we conceive of certain modes of functioning of the nervous system as "conscious," and we determine as well as we may what these modes are by reference to the conscious behavior of the individual. If the destruction or injury of certain areas of the cortex brings about the loss of a certain definite body of conscious content—*e. g.*, as the lesion of the visual center brings about blindness, that is not because a certain group of *cells* is destroyed, but because a certain *functional center* is put out of commission. Leave the cells intact and sever their efferent connections, and you achieve the same result. In other words, it is only because that group of cells has developed the functional differentiation peculiar to it that we can suppose it capable of yielding the specific visual sensation qualities. We attribute the visual qualities to this "visual center" precisely because the discharge of the cells of this center is an integral and essential part of the nervous function of seeing. That they are discharged by the stimuli coming from the retinal end-organs is only a half, or a quarter, of the story, just as their location in the occipital lobes, facilitating certain nervous connections, is probably another quarter. The thing that counts is the peculiar specialization of function. There is no possible justification for stopping short in our physiological explanation with the discharge of the cells of the cortical centers, and yet it too often remains to the psychologist what the marriage altar is to the romantic novelist.

Suppose we turn now directly to the question whether the infant experiences sensations similar to those of the adult, as soon as his sense-organs are capable of functioning. According to the generally accepted opinion of physiologists and genetic psychologists, this depends solely on whether the nervous excitation is capable of reaching the higher sensory centers. In the work of Miss Shinn, for example, which may be taken as fairly representative,[9] we find her, when the psychological evidence of the experiencing of sensation-qualities is ambiguous, repeatedly falling back on the anatomical evidence, and accepting as conclusive the fact that the sensory fibers at the period in question are medullated to the cortical centers. She writes: "If the sensory impulses find functional conducting paths to the highest sensory centers, those of the cerebral cortex, we can have no reason to doubt that feelings of like quality with our own are associated with the central discharge."[10] And again, referring to Flechsig's discovery of the importance of medullation: "According to his [Flechsig's] researches, there is every anatomical reason to suppose that a limited number of impulses can in fact penetrate to the highest sense centers, and that a number of the reflexes observed in the new-born infant are of cortical origin. Where we find the child, then, behaving as if it felt a sense-impression, and when it is known to be anatomically possible that this impression should reach the highest sense centers, we have twofold evidence, which gives us practical certainty of the presence of sensations like our own."[11]

Now in opposition to this representative opinion I should suggest that we have reason to suppose that the stimulation of the cortical centers of the infant yields sense-qualities like our own, only in so far as these cortical areas are indeed functionally differentiated centers like our own, capable of mediating responses like our own. But such they notoriously are not. They possess at first a minimum of functional differentiation. Practically any sense center may yield from the start typical pleasant or unpleasant reactions, and each almost from the start calls out motor reactions in the organ stimulated. Thus the earliest response to light stimulus is a turning the head toward the source, and blinking. This is at first, perhaps, a reflex controlled by the sub-cortical centers; but the first cortical responses are of the same sort. In addition to these are the signs of excitement—the aimless movements of arms and legs. But these are likely to follow the stimulation of any center. In other words, the discharge of the cortical sensory areas follows at first no well-marked paths of motor reaction. It is more likely to follow the short cut back to the region whence it came than any other; but otherwise it overflows in every possible direction, calling out motor reactions of the whole body. Moreover, the possible paths open to it are narrowly restricted. There are few associative connections with other higher centers open to it, for these develop late. If we compare the functioning of a sensory center of the infant with that of the corresponding area of the adult, the difference is enormous. Instead of a few possible avenues of escape, all leading directly to muscular response, there are a countless multitude of possible paths open. Moreover, the possibilities are not indifferent. There is no general spilling-over of the response, but an infinitely complicated system of responses, most of them highly indirect, and involving the coordinated action of many sensory centers. To suppose that this remarkable functional development, unparalleled in any other field of the organic world, can take place and leave the conscious content, mediated by the functioning of the center in question, untouched, is an enormous assumption. And yet that is what is implied in the accepted view. Thus Miss Shinn, summarizing the conclusions to be drawn from the evidence as to the child's sensibility at birth, writes: ''These early experiences, then, unassociated with each other, unassociated with representations of their own former occurrence, are justly to be regarded as *pure sensations,* the simplest forms of consciousness we can conceive. In such experiences as these, there can be no consciousness of space, of externality or internality, of surrounding objects, or of self. Yet since each has its specific quality, these accumulating experiences, once associated, discriminated, remembered, and compared, afford the material for highly developed psychic life.''[12] And again: ''We start out, then, with a content of unconsciousness made up of a limited number of pure sensations, unrelated, unrecognized, unlocated, but varying distinctly in intensity, in affective quality, and in specific quality, . . . from the first a considerable mass of psychic material, awaiting only organization.''[13]

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[9] "Development of the Senses in the First Three Years of Childhood." *Univ. of Cal. Publ. in Educ.*, Vol. 4. I say "representative" without intending to imply that Miss Shinn's utterances on theoretical matters are to be regarded as authoritative. She is, indeed, recognized as an able investigator, and her observations are widely quoted with respect. The leaders in psychological theory are more guarded in their expressions, and it is harder to find them committing themselves in quotable passages. Miss Shinn represents the traditional doctrine implicitly accepted by the great body of psychologists.

[10] *Op. cit.*, page 19.

[11] *Op. cit.*, page 20.

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[12] *Op. cit.,* page 47.

[13] *Op. cit.,* page 49. This passage may well be contrasted with another which seems to me to express a truer insight. Miss Shinn has been criticizing the famous descriptive phrase of William James—''a blooming buzzing confusion,'' which, she says, ''could apply only to a Minerva sprung fully formed from the forehead of Jove.'' She continues: ''Rather does the babe drift softly in among phenomena, wrapped away from their impact in a dim cloud of unconsciousness, through which but the simplest and faintest gleams and

But if we accept the general principle—which indeed all psychologists do accept *as* a principle—that the conscious life of the individual is to be connected with the integrative *functioning* of the nervous system, and not with the chemical discharge of the molecules of gray matter, we no longer have the slightest ground for supposing that the stimulation of the so-called sensory centers of the infant yields sensations of the same specific quality as our own. We no longer have any ground for supposing—nay, the whole presumption is against our supposing—that the enormous differentiation of function which the sensory centers undergo during the months of infancy leaves unmodified the content mediated by them. There can be no "mass of material awaiting only organization." Rather is it true that the very process by which that organization is brought about is the process by which the "material" is itself differentiated. The process of organization which issues in the perception of objects in space is the process by which the visual and tactual and auditory *qualities* of those objects come to consciousness; the process by which the sensations with their qualitative specificities are generated.

But what of the behavior of the child? Does the infant behave as if he experienced our specific sense-qualities? He undoubtedly responds, if not at birth, then soon after, to stimulations received through the special sense-organs. He sees and hears and feels in some way; but that he is experiencing visual and auditory and tactual sensations is more doubtful. What sort of evidence would be required to determine that an individual experiences, or is capable of experiencing, a certain sensory content? Simply and solely the fact that he discriminates, or is capable of discriminating such content in his behavior. Now the infant notoriously does not and can not by his behavior discriminate sensation *qualities.* His behavior, so far as it is more than reflex, consists in a few vague instinctive responses. Moreover his responses are at the beginning all of the sort called "type-reactions." The range and variety of his behavior are far too limited to permit of any discrimination of sensation qualities.

In the early months of infancy it seems to be the so-called higher senses which play the greater part in the child's life. Taste and smell are apparently rudimentary. The child sucks at anything with which its lips come in contact, even contentedly sucking a strong solution of quinine. Smells have been found to call out the same

echoes make their way to him. Then month after month the multiplex vision from without clears itself from the background of cloud, bit by bit, everything grouped and ordered for him in the very process of coming to his consciousness—a wonder and a joy to him, and the most beautiful of all unfoldings to see" (pages 144–145).

reflex sucking response if the stimulus is mild; if stronger, grimaces and choking, which may well be reflex, also, and in any case are no evidence of the experiencing of specific smell qualities.

As to dermal sensibility, reactions are aroused from the earliest days by contact, heat, cold, and what to an adult would be pain stimuli. But these are not discriminatory responses. So far as they differ at all from each other, it seems to be only by way of pleasantness and unpleasantness. I learn from Miss Shinn that in Genzmer's experiments with infants two or three days old the response to needle pricks was not a characteristic pain reaction, but similar to that following contact stimuli, although the slower physiological time and the difference in location of the sensitive spots were evidence that it was the pain end-organs which were stimulated. "It would seem, then," comments Miss Shinn, "that the paths which belong specifically to pain conductions can be permeable, and yet no specific feeling of pain be excited in the subject. The conjecture follows that in this case the excitations reach only the primary centers, and that it is only in the highest centers that pain impressions and contact impressions are differentiated. Yet characteristic pain reactions can not always be regarded as evidence that the higher centers are involved, for the acephalous infant mentioned above, and a similar one examined by Flechsig, both reacted (very feebly) with cries when the skin was slapped or pinched. The facial expression of discomfort and the generally disturbed behavior is safer evidence that pain is really experienced than the mere cry. Even these are, after all, signs of disagreeable feeling in general, not of pain specifically. Still, knowing how much more restricted are the paths of motor expression than those of sensory impression, and how invariable in later life is the rule that excitations of specialized nerve-ends never produce any but the special corresponding sensations, we may reasonably conclude that when a stimulus calculated to excite the nerves of pain is applied, and general signs of discomfort follow, the form of discomfort experienced is really pain."[14] This is a typical case of falling back for support upon physiological doctrine. And yet the only possible evidence available in support of physiological doctrine is behavior. The young infant is incapable of expressing any but "general discomfort." So far as the evidence from behavior goes, that is all he is capable of feeling.

Visual stimulation brings out responses almost from the first. The early responses, as is usually the case, involve movements of the organ or part stimulated. The child, at first apparently by a reflex adjustment, although soon by central control, turns its head toward the lighted part of the room. Later the eyes fixate the source of light, or bright objects and surfaces. In addition to the local response there is a typical response of pleasantness. The type-reactions of pleasantness and unpleasantness are indeed almost invariable accompaniments of the more specific responses. The point is that *any* stimulus of the organ in question brings out the same sort of vague local response. The only sort of discrimination in any sense department is for long what one may call a "preferential discrimination." Some stimuli, that is, call out a stronger response than others, together with a more marked pleasant or unpleasant reaction. Thus bright and glittering objects, or surfaces with marked light and shade contrasts are gazed at longer and more exclusively, and bring out marked signs of pleasurable excitement.

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[14] *Op. cit.*, page 35.

In regard to color sensitivity proper, a number of interesting investigations have been made, notably by Baldwin, MacDougal, Shinn, Chas. S. Myers, Helen Thompson Woolley, and C. W. Valentine. The conclusions drawn by these investigators on the basis of their methods rest upon assumptions of fundamental theoretical importance. The experiments of all of these psychologists, with the exception of Valentine, were made with infants in the grasping period, and the conclusions drawn were based on the number of times papers, wools, etc., of various colors and presented in various ways, were grasped after.

In Mrs. Woolley's tests, for example, pairs of colored paper discs of similar texture, shape, and brightness were presented to the child in a series of 10–12 choices, half in each of two positions, to eliminate preference for position or hand used. It was found that red was decidedly preferred to blue, green, and the black-white series, although no appreciable preference was shown for red over yellow. Yellow, when paired with blue, green, and the black-white series, however, stood even with blue, behind black, and well ahead of green, white, and gray. Mrs. Woolley concludes that red, blue, and yellow were perceived as colors, but that it was uncertain whether green was perceived as a color. That is, what was shown was that the child preferred, in a more or less marked degree pieces of paper of certain colors to those of certain others. Now is this evidence that the child experienced sensations of the same specific quality that an adult would have done? It seems to me at least doubtful. Even more doubtful are the conclusions reached by Valentine.[15] The grasping method is, of course, not applicable to children before, at least, the fifth month, since before that time the grasping instinct is not sufficiently developed. Valentine wished to test younger children and

[15] *British Journal of Psych.*, Vol. 6, page 363.

made the attempt with an infant of three months by observing the relative lengths of time wools of different colors were gazed at. Two wools of different colors were presented side by side against a dark gray coat, slowly drawn apart 8 inches, and left motionless. A record was kept of the number of seconds the child gazed at either wool, or at neither, for a period of two minutes from the time the child first looked at either. Then a rest interval was allowed, after which a new test was made, care being taken to eliminate any preference of position by interchanging the colors. The order of preference of the different colors (yellow, white, pink, red, brown, black, green, blue, violet) was determined by percentages figured by comparing the total number of seconds each color was gazed at, with the total number of seconds it might have been gazed at. Valentine found that yellow stood highest, with white and pink close second and third; red, brown, black, green, and blue next, in order given, while violet was markedly below all the others. These preferences were not, Valentine argues, based wholly on brightness, since yellow stood higher than white, and red higher than blue or green, and much higher than violet, although of the same brightness with them. He draws the conclusion, therefore, that sensations of red, yellow, green, blue, and brown were all experienced by the infant. But surely this is scarcely warranted by the evidence. The response of gazing is of the simplest sort, comparable to a mere tropism, and the fact that certain colors are more effective stimuli to this response than others is no indication of *quality* of sensation. The phenomena would seem rather to be allied to the known greater physiological influence of the so-called "warm" colors, notably red, discovered by Féré.[16]

If the evidence from behavior is to be taken on its own merits, we can attribute a qualitative difference to two stimuli only when responses are correspondingly different in kind. Mere "preferential discrimination" is not sufficient. It is only preconceived psychophysical theory which gives one any reason whatsoever for supposing otherwise.

The tests used with an older child or an adult for color-blindness all involve a *sorting* of the colored materials, an *arrangement* of them in serial order. This, of course, implies the perception of colors as like and different, and as more or less like and different. Each tint or shade brings out a response appropriate to the specific character of the stimulus and characteristically different from the response demanded by every other tint and shade. The responses themselves form a series of graduated acts commensurate with the series of stimuli. This is a sort of behavior of an altogether different order from the merely "preferential discrimination" shown by the gazing or grasping infant; and it is a sort of behavior of which the infant is utterly incapable. To suppose that in spite of this incapacity, the infant receives sensations of the same specific quality as does the older child who places orange between red and yellow, and purple between red and blue, seems to be an unwarranted and wholly unnecessary assumption. What makes it plausible is that it is difficult for us to imagine why the yellow and red are preferred to other colors (as they usually are), if they are not seen *as* "red" and "yellow." When brightness and saturation differences are ruled out, what other difference between a bit of red and a bit of blue paper exists to make the one more attractive to the baby than the other? But this question rests, it seems to me, on a false conception of the whole matter. It must, of course, remain unimaginable to us how the baby sees the red and the blue, for we have no terms in which to imagine it. Perhaps, however, we can imagine what it would be like to see things as simply and vaguely "red" and "blue," and not as scarlet and cardinal and crimson, nor as turquoise and ultra-marine and sapphire, for many of us habitually see the hues and tints of things thus loosely, and all of us do frequently. We may be vaguely aware of one wall-paper as pleasing and another as displeasing, without having any idea of what hues the papers are. We may literally never have *seen* the hues which we now on examination see them to have. Now the infant's color consciousness in its early stages may well be analogous to this. To say that he first sees all objects as *gray,* and later on begins to see washed-out reds and yellows is, I believe, a falsification. It is carrying over the terms descriptive of the highly differentiated structural elements of a late stage in evolution and applying them to the structures of an earlier and simpler type.[17]

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[16] Referred to by Valentine, *op. cit.*, page 375.

Of qualitative diversity and specificity such as is experienced by the adult, there is, so far as I can see, no positive evidence given by the behavior of the child during the early months of infancy. The earliest discriminations in response would seem to be between what is pleasant and unpleasant. Along with this goes from the first a localization of response, the earliest reactions being movements of the organ or part stimulated, often to facilitate or prevent further stimulation: as the turning the head and eyes toward the light, the attitude of listening, the sucking at whatever touches lips or mouth, the clasping which follows a touch on the palms, etc. From the first there seems good evidence that visual, auditory, and dermal stimuli are experienced as different from each other in a way which might be loosely described as difference in quality. That dermal stimuli of contact, heat, cold, and pain are experienced as qualitatively distinct seems more doubtful. One might venture the opinion that "local sign" is developed earlier than differences in specific quality.

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[17] It is worth while to quote in this connection a paragraph from Chas. S. Myers (*Br. Jr. of Psych.,* Vol. 2, page 360): "Surely it is more likely that vibrations of whatever frequency, so long as they affect the infant's retina and cochlea at all, at first evoke merely sensations of light and sound, and that from this primary experience of light the colored and colorless series of sensations become gradually and simultaneously differentiated, while from the primary experience of sound tones of various pitch and noises are similarly differentiated from one another. It seems to me most improbable that, in the development of the individual or of the race, sensations of one color region or of one tone region develop before those of other regions. I look on the process of sensory development as a gradual unfolding, a gradual appearance of diversity among experiences which earlier seemed identical."

In conclusion I wish to say a few words as to the positive character of the early experience of the baby. It is often, perhaps usually, believed that it is a passive experience, that the baby is ushered into a world of kaleidoscopic confusion, a multitude of fleeting impressions or presentations, which in William James's phrase "come and are and have their being," and which only slowly and gradually acquire order and significance. So far from this being true, I believe one might rather say that the baby's world contains neither confusion nor separate impressions which can be "presented" or have "being." It is rather a world of imperative urgencies and impulsions, so immediate that the presentation is lost in the effort of looking or grasping or sucking or shrinking, as with us the quality of the itch is lost in the urgency to scratch, or the quality of intense pain in the shrinking from its intolerable unpleasantness. Only—and this is an enormous difference—we can refrain from scratching, and can to some extent conceal our suffering, whereas for the baby to feel *is* to suck. Just as there is no possibility of inhibition and choice of response, so there is no experienced "what" of the stimulus. What it is and what it demands are so telescoped together that both are lost, and there is an experience which is neither sentient nor noëtic, but something simpler than either. The conception of "pure sentience" is one gained by abstracting an aspect of our own experience. For us, the sensuous world has lost, to a large extent, its immediate urgencies; and so, from the vantage-ground of our very indifference, we can in passive contemplation savor its qualities. But for the baby the conditions for this are all wanting. Because the sights and sounds and smells are experienced only to be immediately responded to, because they permit no choice of response, they have acquired no true significance and no specific character as presentations.

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(*To be continued*)